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ABSTRACT

The first objective of this study was to investigate which aspects of temperament are related to externalizing problem behavior and which aspects are related to internalizing problem behavior. The second objective was to investigate how parenting influences the link between temperament and problem behavior. The sample included 89 two-parent families and their firstborn 36-month-old children, and 81 day care and preschool playgroup teachers. Mothers, fathers and teachers filled in questionnaires and home observations took place. The results showed that different temperament characteristics predict externalizing and internalizing problems. Further, the results indicate that parenting moderates the relation between temperament and problem behavior. More specifically, positive control of the father buffered the relation between impulsivity and externalizing problems, whereas negative control of the mother and father strengthened the relation between fear and internalizing problems.

Approximately 10–15% of preschoolers have mild to moderate problems (Campbell, 1995). In the dimensional approach to psychopathology these problems can be classified into two broadband syndromes: externalizing and internalizing problems (Wenar & Kerig, 2000). Both types of problem behavior refer to expressions of dysfunction (Mesman, Bongers, & Koot, 2001). Externalizing problems include aggressive and delinquent behavior (e.g., disobedience). Internalizing problems refer to anxiety, depression, somatic complaints and withdrawn behavior (Bongers, Koot, Van der Ende, & Verhulst, 2003). Research on childhood pathology has focused mostly on externalizing problems, probably because parents and teachers perceive children with externalizing problems as disruptive and children with externalizing problems are likely to experience social and academic difficulties later in life (Wenar & Kerig, 2000). Internalizing problems have received less attention, although internalizing problems such as anxiety and withdrawn behavior at a young age have considerable consequences for the development of children too. Early internalizing problems have been found to predict internalizing problems in later childhood and pre-adolescence (Mesman et al., 2001). Therefore, efforts need to be made to prevent both externalizing and internalizing problem behavior, which requires the understanding of related and predictive factors, both within the young child and within the environment. In previous research, temperament and parenting have been identified as two important predictors of problem behavior in young children (Putnam, Sanson, & Rothbart, 2002).

Temperament is defined as "constitutionally based individual differences in reactivity and self-regulation, as seen in the emotional, motor, and attentional domains" (Rothbart, Ellis, & Posner, 2004, p. 357). By constitutionally based, it is meant that temperament is biologically based, but influenced over time by genes, environment, and experience. Temperament

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encompasses the way situations are approached and includes several child characteristics, such as impulsivity, and the level of negative affectivity (Rothbart et al., 2004). Negative affectivity or negative emotionality includes anger/frustration, fear and sadness (Eisenberg et al., 2005). Children who are characterized by frequently and intensely showing impulsive, angry or frustrated, fearful and sad behavior, can be described as difficult. The opposite pole can be described as easy (Putnam et al., 2002).

Nigg (2006) has proposed two alternative models to clarify the relation between temperament and problem behavior. The first model, the spectrum model, assumes that problem behavior is an extreme of common child characteristics and that many aspects of problem behavior reflect the same underlying structure as the normal range of temperamental characteristics. The second model, the vulnerability model, assumes that certain types of temperament predispose children to problem behavior, especially in some contexts. In empirical work, some support for the spectrum model has been found. For example, biometric twin data suggest that ADHD is an extreme of a continuous dimension of inattentive and impulsive behavior (Nigg, 2006). Consequently, if problem behavior is assumed to reflect extremes of underlying temperamental dimensions, measures of temperament and problem behavior would have some overlap in their item content. Indeed, ratings of temperament and problem behavior often include identical items. However, Lengua, West, and Sandler (1998) and Lemery, Essex, and Smider (2002) have analyzed the association between temperament and problem behavior with and without the overlapping items. The correlation between temperament characteristics and problem behavior remained essentially unchanged, indicating that item overlap cannot explain the relation between temperament and problem behavior. Further, results of a parent-training intervention study showed that mothers in the intervention group reported less externalizing and internalizing problems, than mothers in the control group, but the ratings of temperament did not change after the intervention (Lemery et al., 2002). These results suggest that temperamental characteristics do not reflect the same underlying structure as problem behavior (Egger & Angold, 2006), which is in line with the vulnerability model.

Belsky, Hsieh, and Crnic (1998) have studied observed general negative emotionality as a measure of temperament. With this composite measure they have not found a relation between negative emotionality and problem behavior. However, when different aspects of negative emotionality are investigated separately, childhood temperament is found to contribute differently to the development of externalizing and internalizing problems (Eisenberg et al., 2001). Research has shown that externalizing problems in school-aged children are associated with high impulsivity. Also, school-aged externalizers are more prone to anger than internalizers (Eisenberg et al., 2001, 2005). School-aged internalizers are low in impulsivity, compared to non-disturbed children. Internalizers seem to be more prone to sadness and fear (Eisenberg et al., 2001, 2005) and to fear/shyness (Bates, Pettit, Dodge, & Ridge, 1998; Leve, Kim, & Pears, 2005). However, the relation between sadness and fear and internalizing problems has not been found consistently (Eisenberg et al., 2001). Also, conflicting evidence exists with regard to the relation between anger and internalizing problems. Some researchers have found low associations between anger and internalizing problems, whereas when older children and more serious levels of internalizing problems are investigated, stronger relations between anger and internalizing problem behavior have been found (Eisenberg et al., 2005; Morris et al., 2002). Although there are still some inconsistencies with regard to the relation between negative emotionality and internalizing problems, the associations between temperament and problem behavior are seen as promising for the understanding of the roots of these problems (Nigg, 2006).

Research on the influence of parents on child behavior has highlighted parenting as an important environmental predictor of problem behavior (Aunola & Nurmi, 2005). It has been found that preschoolers' externalizing problems are predicted longitudinally by negative control, such as parent's criticizing and ignoring the child, and parent's overinvolvement (Bradley & Corwyn, 2008; Campbell, 1995; DeKleyn, Speltz, & Greenberg, 1998; Mantymaa, Puura, Luoma, Salmelin, & Tamminen, 2004; Morris et al., 2002). Further, externalizing problems are predicted by less frequent displays of warmth and responsiveness, such as encouragement, smiles, laughs, and physical affection (Olson, Sameroff, Kerr, Lopez, & Wellman, 2005). Positive control, such as limit setting, provision of structure and sensitivity, is associated with less externalizing problems (Newby & Fischer, 1991). Less research has been done on the relation between preschooler's internalizing problems and parenting. One study has shown that negative control and lack of warmth during infancy is associated with preschoolers' internalizing problem behavior (Mantymaa et al., 2004).

To conclude, previous research has shown that both temperamental child characteristics and parenting are related to problem behavior in young children. To further the understanding of the processes by which temperament affects the development of problem behavior, the influence of parenting on the link between temperament and problem behavior needs to be studied (Lerner, Castellino, Patterson, Villaruel, & McKinsey, 1995). Parenting can influence the relation between temperament and problem behavior in two possible ways (Baron & Kenny, 1986). First, parenting may moderate the relation between temperament and problem behavior (Belsky, Bakermans-Kranenburg, & van Ijzendoorn, 2007). Research suggests that negative control may strengthen the relation between temperament and problem behavior and that positive control and parental warmth may buffer this relation. For example, negative emotionality and measures of difficult temperament are found to be linked to externalizing and internalizing problems in toddlers, especially in families with parents high on negative control (Morris et al., 2002; Putnam et al., 2002; Van Aken, Junger, Verhoeven, Van Aken, & Deković, 2007). Oversolicitous parenting, intrusiveness and derisiveness were related to greater internalizing type behavior among inhibited or fearful children only (Rubin, Burgess, & Hastings, 2002; Rubin, Hastings, Stewart, Henderson, & Chen, 1997). The relation between toddlers' impulsivity and externalizing behavior at age 7–10 years was less strong when the mother was relatively high in positive control (Bates et al., 1998). Other studies found that preschool-aged children with difficult temperaments seem to benefit from positive control and sensitive parenting by showing fewer externalizing problems (Bradley & Corwyn,

2008; Karreman, Van Tuijl, Van Aken, & Deković, 2009). Second, parenting may mediate the relation between temperament and problem behavior (Putnam et al., 2002). As a result of temperamental differences, children present different stimuli to parents. Parents who are stimulated differently may react differently, which results in further individual developmental differences (Lerner et al., 1995). For example, difficult children are found to elicit more negative control from their parents, which in turn predicts later externalizing problems (Campbell, 1995). Infants' difficult temperament is related to less maternal warmth (Lerner et al., 1995), which in turn predicts externalizing problems (Olson et al., 2005)

In sum, previous research has shown that there is a relation between temperament, parenting and problem behavior, but there are still some gaps in this research area. First, conflicting evidence exists regarding the relation between negative emotionality and internalizing problems. Therefore, the first aim of this study is to investigate which aspects of temperament are related to externalizing problem behavior and which aspects are related to internalizing problem behavior. In line with previous research (e.g., Eisenberg et al., 2005), it is expected that externalizing and internalizing problem behavior are predicted by different temperamental factors. Externalizing problem behavior is expected to be predicted by high impulsivity and high anger or frustration, whereas internalizing problem behavior is expected to be predicted by high fear, high sadness and low impulsivity.

Second, the relation between parenting and internalizing problems has not received much attention in earlier research. Furthermore, a shortcoming of many previous studies on parenting is the focus on mothers (Park, Belsky, Putman, & Crnic, 1997) or the focus on families with the mother as the primary caregiver. The latter studies generally have shown that problem behavior is more strongly related to maternal than paternal parenting (Rothbaum & Weisz, 1994). Nowadays fathers have a greater role in the parenting of children, especially in double income families (Bonney, Kelley, & Levant, 1999). Moreover, mothers and fathers do not fulfil the same role in their families. Mothers normally provide more caregiving than fathers do, whereas fathers engage more in playtime. Therefore, the influence of both mothers and fathers on their child's behavior needs to be studied (DeKleyn et al., 1998). Thus, the second aim of this study is to investigate how both maternal and paternal parenting influence the link between temperament and externalizing as well as internalizing problem behavior of Dutch preschoolers living in double income families. Two alternative models are tested: parenting as moderator and parenting as mediator. We expect to find strongest support for the moderating model. The relation between temperament and problem behavior is hypothesized to be strengthened by negative control, and buffered by positive control and by parental warmth. Due to the scarcity of studies focusing on both mothers and fathers, no specific hypotheses about differences between fathers and mothers are formulated.

1. Method

1.1. Participants

Participants were 89 two-parent families raising firstborn preschool-aged children, living in different parts of the Netherlands. Also, 81-day care and preschool playgroup teachers were included in the study. All toddlers (45 boys, 44 girls) were 36 months old at the time of the study. The mean age of the fathers was 36.5 years ($SD = 4.7$, range 22–50). The mean age of the mothers was 34.5 years ($SD = 4.2$, range 21–46). All mothers and fathers were the biological parents of the children. In 56% of the families, the child had a younger sibling. The majority of the parents were Dutch (98% percent of the fathers and 99% of the mothers). Most parents worked outside the home (97% of the fathers and 94% of the mothers) and were highly educated (66.3% of the fathers and 55.2% of the mothers had a bachelor or master degree) or moderately educated (30.5% of the fathers and 41.6% of the mothers finished professional education or high school). The remaining percentage of parents finished another form of education. In the majority of the families (95%), mothers and fathers spent approximately an equal amount of time with their children, in the form of playtime or childcare.

1.2. Procedure

This study was part of a research project on family dynamics and child adjustment. The toddlers were recruited through day care centres and preschool playgroups in different parts of the Netherlands. Day care and preschool playgroup teachers distributed an introductive letter and a short questionnaire among the parents. Three hundred and sixty-eight parents sent back the questionnaire. The researcher checked which parents gave permission for further contact and selected the parents who lived together and had a nearly 3-year-old firstborn child. These parents were contacted by phone by the researcher. Of the 130 contacted families 89 families agreed to participate.

Home observations took place at age 3 to measure parenting. The observations consisted of two sessions: a mother–child play session and a father–child play session. Each session took about 15 min and consisted of unstructured and structured play tasks, most of them followed by a clean-up period. The tasks involved solving a matching game, engaging in a building game, and reading a picture book. In order to prevent the child from becoming bored by the tasks, the matching and building games were similar, but not the same in mother–child and father–child interaction. The same picture book was used in both parent–child dyads, because each dyad makes up their own story. The sessions were videotaped and afterwards independently coded by a trained coding team.

For all tasks, we rated behavior in 3 min of family interaction: the first, middle, and last minute of each task. Thus, for each session, nine ratings per dimension were created. This mesoanalytic way of coding has the advantage over microanalytic

systems of containing individually analyzable codes and it has the advantage over macroanalytic systems of observing interactions in detail, allowing changes in behavior over time (Lindahl, 2001).

After the home observations 71 parents agreed to fill out questionnaires about their child's problem behavior, and their child's temperament. The parents who did and did not fill out the questionnaires differed with regard to education. Mothers ($t(84) = 2.56$, $p = .014$) and fathers ($t(86) = 4.13$, $p > .001$) who did fill out the questionnaires finished higher educations than the parents who did not fill out the questionnaires. They did not differ with regard to the other background variables. Day care and preschool playgroup teachers ($N = 81$) also filled out questionnaires about the child's problem behavior.

1.3. Measures

Externalizing and internalizing problem behavior were measured with the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997; Dutch translation; www.sdqinfo.com). The SDQ is a widely used brief behavioral screening questionnaire, with psychometrical properties that are comparable to the Child Behavior Checklist (Goodman & Scott, 1999; Muris, Meesters, & Van den Berg, 2003; Van Widenfelt, Goedhart, Treffers, & Goodman, 2003). Furthermore, the SDQ has been shown to be good at detecting problem behavior in a community sample of children (Goodman & Scott, 1999).

Fathers, mothers, and day care/preschool playgroup teachers reported on this 25-item questionnaire. Answers on statements were given on a 3-point scale, ranging from 0 = "not true" to 2 = "certainly true". Externalizing problem behavior was measured with the Hyperactivity (e.g., "Restless, overactive, cannot stay still for long") and Conduct problems (e.g., "Often has temper tantrums or hot tempers") subscales. Internalizing problem behavior was measured with the Emotional problems subscale (e.g., "Nervous or clingy in new situations, easily loses self-confidence"). Each subscale consisted of 5 items. The scores of the different informants correlated significantly (from $r = .35$ for mother and teacher reported internalizing problems to $r = .76$ for mother and father reported externalizing problem behavior, all p-values $< .010$). Therefore, the mean scale score of the three informants was used in further analyses. Cronbach's alpha was .91 for the mean scale score of Externalizing problems and .68 for the mean scale score of Internalizing problems.

Temperament was measured with the Children's Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershy, & Fisher, 2001; Dutch translation; Majdandžić & Van den Boom, 2001), filled out by both fathers and mothers. The questionnaire consisted of 195 items, which could be answered on a 7-point scale (1 = not at all true for my child, 7 = totally true for my child). The following subscales were used in the present study: Anger/Frustration (e.g., "Gets angry when he/she has to go to bed"), Fear (e.g., "Is afraid of loud noises"), Sadness (e.g., "Tends to become sad if the family plans don't work out"), and Impulsivity (e.g., "Usually rushes into an activity without thinking about it"). All subscales consisted of 13 items. The correlations between father reported scores and mother reported scores were high: $r = .54$ for Anger/Frustration, $r = .58$ for Fear, and $r = .76$ for Impulsivity ($p < .001$). Only the correlation between the reports of fathers and mothers on Sadness was low ($r = .18$, $p > .05$). Because most of the correlations between the two informants were high, the mean scale score of the two informants is used in further analyses. Cronbach's alpha's ranged from .61 for Sadness to .90 for Impulsivity.

Observed parenting was measured with the Coparenting and Family Rating System (CFRS; McHale, 1995). Rating scales were translated into Dutch and pilot tested. The scales measure behaviors during dyadic mother–child and father–child interactions. Six dimensions of parenting were scored on a 7-point scale. *Warmth* measures the frequency and intensity of affect shown towards the child by the parent, such as encouragement, smiles, laughs, and physical affection. *Investment* assesses the extent to which a parent is involved with the child and concerned that the child behaves or performs tasks correctly. *Limit setting* measures the extent to which a parent prevents the child from wandering away from assigned tasks. *Sensitivity* refers to the timing and quality of a parent's interventions with the child. *Provision of structure* refers to the extent to which a parent structures the task and provides information about it. *Negativity* encompasses the degree of a parent's criticizing, ignoring the child, and being overtly annoyed during the session.

The observed parenting scales were coded by two coders. Interrater reliability for each pair of coders was based on approximately 15% of all cases. Gamma was used as a measure of reliability, because it is a statistic that controls for chance agreement, and is more appropriate for ordinal data than Kappa (Liebetrau, 1983). Mean Gamma for parenting was .88, ranging from .79 (sensitivity father–child) to .96 (limit-setting mother–child).

Principal components analysis with varimax rotation of six rating scales yielded three parenting factors: positive control, negative control, and warmth. For both mothers and fathers, the three-factor solution accounted for 74% of the variance in parenting scores. *Positive control* consisted of the scales provision of structure, limit setting and sensitivity. *Negative control* contained negativity and investment. The positive loading of Investment on Negative control can be explained by the aspect of over involvement: when a parent is continually present, which was rated in most mothers and fathers, it may be intrusive for the child. The factor *Warmth* consisted of the scale warmth. All factor loadings were above .51 for mothers and above .64 for fathers. The three parenting factors are used in further analyses.

1.4. Analytic strategies

To investigate the relations between temperament, parenting and problem behavior we performed multiple regression analyses. We first tested the relation between temperament and problem behavior. Second, we added the parenting variables and the interaction terms to test the moderation model. Third, we tested the mediation model.

Table 1
Means and standard deviations of all variables and Pearson's correlations among all variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Externalizing problems	–											
2. Internalizing problems	−.06	–										
3. Impulsivity	.62**	−.35**	–									
4. Anger	.46***	.27**	.31**	–								
5. Fear	.18	.46***	−.02	.50***	–							
6. Sadness	.32**	.22*	.35***	.66***	.45***	–						
7. Parental warmth mother	−.02	.14	.04	.14	.12	.09	–					
8. Positive control mother	−.15	−.10	−.08	−.12	−.10	−.20*	.05	–				
9. Negative control mother	.19*	−.06	.26*	−.01	.15	.04	.04	−.01	–			
10. Parental warmth father	−.12	.14	−.05	.19	.01	.10	.32***	.13	−.24*	–		
11. Positive control father	−.13	−.10	−.14	−.06	−.04	−.26*	−.02	.60***	.03	.04	–	
12. Negative control father	.24*	−.10	.31**	.08	.14	.12	.02	.04	.37***	−.14	.11	–
Mean	.53	.21	4.45	4.08	3.44	3.51	4.42	5.23	3.05	4.31	5.51	2.95
SD	.34	.19	.81	.73	.76	.52	.57	.69	.40	.63	.51	.36

Note: *N* ranges from 72 to 88.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Model assumptions were checked prior to the analyses. It appeared that externalizing and internalizing problems, and the scores on the parenting scales were skewed. All analyses were also conducted with logarithmic transformed variables (Tabachnick & Fidell, 2001). Because this did not affect the results, the original variables were retained for the analyses. All analyses were conducted separately for externalizing and internalizing problem behavior. To avoid collinearity between the effects of temperament and parenting, and the interaction terms in the moderation model, the temperament and the parenting variables were standardized before creating interaction terms. As a result *B*-values instead of beta's are reported. Pairwise deletion is used to deal with missing values. Thus, the sample size varies across analyses.

2. Results

2.1. Descriptive analyses

The sample size varied for parent reports ($N = 72$ mothers and 72 fathers) and observational data ($N = 89$ mothers and 89 fathers). The families in which only parent reports were available did not significantly differ from the families of the observational data on the following demographic variables: educational level, nationality, marital status, gender of child, one versus more children, age of parents, hours work outside the home, and amount of years together with partner. There were also no significant differences between these families on dimensions of maternal and paternal parenting, children's temperament and problem behavior.

The means and standard deviations of all variables and the correlations among all variables are presented in Table 1. Significant positive correlations were found between the different temperamental variables, except for Impulsivity and Fear. Maternal and paternal parenting behaviors were significantly associated ($r = .32$ for Parental warmth, $r = .37$ for Negative control, $r = .60$ for Positive control). All temperamental variables were significantly related to both Externalizing and Internalizing problem behavior, except for Fear, which was only related to Internalizing problems. The pattern of association was similar for mothers and fathers. Negative control of the father and of the mother was positively related to Impulsivity and Externalizing problems. Positive control of mothers and of fathers was negatively related to Sadness. The parenting variables were not significantly related to Internalizing problem behavior.

2.2. Temperament and problem behavior

To investigate which aspects of temperament are related to Externalizing problem behavior and which aspects are related to Internalizing problems, we performed multiple regression analyses with the temperament variables entered in one step. Anger, Fear, Sadness and Impulsivity explained 47.7% of the variance in Externalizing problems, $F(4,68) = 15.50$, $p < .001$. The regression coefficients for Anger ($B = .16$, $p = .008$) and Impulsivity ($B = .24$, $p < .001$) both differed from zero. The effects of Impulsivity and Anger on Externalizing problems were medium to large according to the criteria of Cohen (2003). The regression coefficients for Fear and Sadness were not significant. As expected, higher scores on Impulsivity and higher scores on Anger are associated with more Externalizing problems.

For Internalizing problems, the temperament variables Anger, Fear, Sadness and Impulsivity explained 37% of the variance, $F(4,68) = 9.97$, $p < .001$. Fear ($B = .08$, $p = .010$) and Impulsivity ($B = -.10$, $p < .001$) both predicted Internalizing problems, with medium to large effect sizes (Cohen, 2003). Anger and Sadness were not significant predictors. In line with the expectations,

Table 2
Relations between externalizing problem behavior, temperament, and parenting.

	Mothers			Fathers		
	B	*β*	ΔR^2	*B*	*β*	ΔR^2
Step 1			.49***			.49***
Impulsivity	.25***	.60***		.25***	.60***	
Anger	.15**	.34**		.15**	.34**	
Fear	.05	.12		.05	.12	
Sadness	−.12	−.19		−.15	−.19	
Step 2			.02			.03
Parental warmth	−.04	−.08		−.09	−.15	
Positive control	−.06	−.09		−.05	−.09	
Negative control	.06	.06		.04	.05	
Step 3						
Impulsivity × Positive control	−.09	−.19	.05	−.08	−.24*	.08*
Anger × Positive control	.01	.02		−.01	−.04	
Fear × Positive control	−.08	−.20		−.07	−.18	
Sadness × Positive control	.07	.15		−.02	−.05	

Note: Only analyses with significant interaction effects for mothers or fathers are shown; *N* ranges from 72 to 88.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

lower scores on Impulsivity and higher scores on Fear were associated with more Internalizing problems. Sadness was also hypothesized to predict Internalizing problems, but this was not the case.

2.3. Parenting as a moderator

To test the moderation model we performed hierarchical multiple regressions, separately for mothers and fathers to avoid dependency in the data. To predict problem behavior, temperament variables were entered first, the parenting variables were entered in the next step and interaction terms were entered in the final step (Whisman & McClelland, 2005). To reduce the number of predictors, regression analyses were conducted separately for each parenting behavior (Parental warmth, Positive control, or Negative control) by including the interactions with that specific behavior in the same step. The results of the models with a significant interaction effect are presented in Tables 2 and 3, for Externalizing and Internalizing problem behavior, respectively.

For Externalizing problem behavior, only the interaction effect of Impulsivity and Positive control of the father was significant: the effect of Impulsivity was buffered by Positive control of the father. To interpret this interaction effect further, this effect is visualized in Fig. 1. In order to obtain this visualization, we computed the slope of Impulsivity when the score on Positive control was high (more than one standard deviation above the mean), and low (more than one standard deviation

Table 3
Relations between internalizing problem behavior, temperament, and parenting.

	Mothers			Fathers		
	B	*β*	ΔR^2	*B*	*β*	ΔR^2
Step 1			.36***			.36***
Impulsivity	−.10***	−.43***		−.10**	−.43**	
Anger	.04	.15		.04	.15	
Fear	.08*	.30*		.08*	.30*	
Sadness	.05	.15		.05	.15	
Step 2			.01			.02
Parental warmth	.02	.08		.03	.09	
Positive control	−.02	−.06		−.03	−.12	
Negative control	.00	.00		.01	.02	
Step 3						
Impulsivity × Negative control	.02	.10	.08	.04	.15	.06
Anger × Negative control	−.05	−.21		.00	−.01	
Fear × Negative control	.08	.32**		.09	.26*	
Sadness × Negative control	−.01	−.03		−.08	−.27	

Note: Only analyses with significant interaction effects for mothers or fathers are shown; *N* ranges from 72 to 88.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

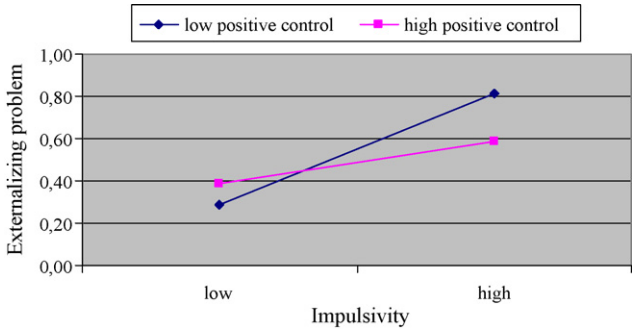

Fig. 1. The relation between impulsivity, positive control of the father and externalizing problem behavior.

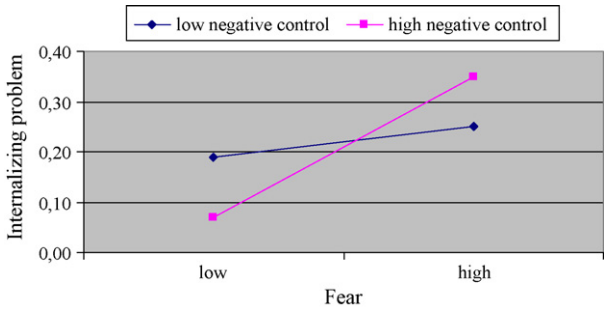

Fig. 2. The relation between fear, negative control of the mother, and internalizing problem behavior.

below the mean) (Jaccard, Turrisi, & Wan, 1990). It appeared that Impulsivity is more strongly associated with Externalizing problems, when Positive control of the father was low ($B = .26$), than when Positive control of the father was high ($B = .10$). So, in general it can be concluded that high scores on Impulsivity were associated with high scores on Externalizing problems. However, the relation was less strong for children with fathers who score high on Positive control. Thus, high Positive control buffered the relation between Impulsivity and Externalizing problems.

For Internalizing problem behavior, the interactions between Fear and Negative control of the mother and father were significant. Visualizations of these moderation effects of Negative control can be seen in Figs. 2 and 3. To interpret these effects, we computed the slopes of Fear when the score on Negative control was high and low. It appeared that the relation between Fear and Internalizing problems was less strong when Negative control was low ($B = .03$ for mothers, $B = -.06$ for fathers) than when Negative control was high ($B = .13$ for mothers and $B = .17$ for fathers). Thus, high Negative control strengthened the relation between Fear and Internalizing problems.

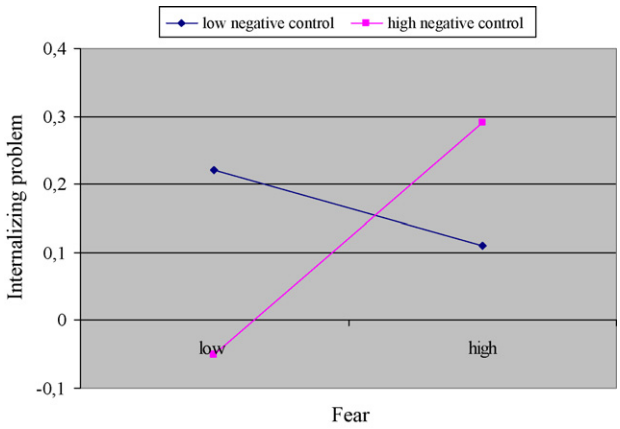

Fig. 3. The relation between fear, negative control of the father, and internalizing problem behavior.

2.4. Parenting as a mediator

To test whether parenting mediated the relation between temperament and problem behavior, we first checked which temperament variables were related to problem behavior, which temperament variables were related to parenting, and finally which parenting variables were associated with problem behavior. Second, we tested the relation between temperament and problem behavior. Third, we controlled for parenting and tested this relation again. If the relation between temperament and problem behavior, controlled for parenting is no longer significant, then parenting may be a mediator (Baron & Kenny, 1986).

Negative control of fathers and of mothers was the only parenting variable that meets the requirements for mediation, and only for the relation between Impulsivity and Externalizing problems (see Table 1). The relation between Impulsivity and Externalizing problems ($B = .26$, $p < .001$) did not change when we controlled for Negative control of the mother ($B = .25$, $p < .001$) or of the father ($B = .24$, $p < .001$), so Negative control did not mediate the relation between temperament and problem behavior.

3. Discussion

The first aim of this study was to investigate which aspects of temperament are related to externalizing problem behavior and which aspects are related to internalizing problems. As expected, impulsivity and anger were positively associated with externalizing problems. This is consistent with earlier findings of Eisenberg et al. (2001, 2005) and suggests that externalizers may act out due to unregulated anger and frustration (Eisenberg et al., 2001; Rubin, Burgess, Dwyer, & Hastings, 2003). Impulsivity was negatively associated with internalizing problems, whereas fear was positively related to internalizing problems. Low impulsivity may reflect reactive overcontrol, which is found to be related to internalizing problems (Robins, John, Caspi, Moffit, & Strouthamer-Loeber, 1996). There is evidence that suggests a genetic connection between temperamental fearfulness and internalizing problems. Stress due to fear may further explain the link between fear and internalizing problems (Leve et al., 2005). Sadness was also hypothesized to predict internalizing problems, but support was not found in this study. In earlier empirical studies, generally using older samples, more aspects of temperament were found to be related with internalizing problem behavior. For example, school-aged internalizers were found to be more sad and more angry than non-disordered children (Eisenberg et al., 2005). This suggests that the associations between temperament and internalizing problems become more pronounced over the years, possibly as a result of cumulative influences over time (Rothbaum & Weisz, 1994).

As reported earlier, Nigg (2006) has proposed two alternative models to clarify the relation between temperament and problem behavior: the spectrum model and the vulnerability model. In the present study the bivariate proportions of variance in problem behavior that were explained by temperament were ranging from small (0% of externalizing problem behavior was explained by fear and 1% of internalizing problem behavior by sadness) to moderate in size (38% of externalizing problem behavior was explained by impulsivity and 15% of internalizing problem behavior by anger), suggesting that no more than 40% of the variance is shared between temperament and problem behavior. If temperament and problem behavior were extensions of the same dimensions, as suggested by the spectrum model, these associations would be higher (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). Thus, the results of this study call into question the spectrum model.

The second aim of this study was to investigate two alternative models for the role of parenting in the relation between temperament and problem behavior: parenting as moderator and parenting as mediator. As expected, support was found for the moderating model. It was found that positive control of the father buffered the relation between impulsivity and externalizing problems, whereas negative control of the mother and father strengthened the relation between fear and internalizing problems. This is consistent with earlier research. Children with a difficult temperament living in well-functioning families were found to be less likely to have externalizing problems than children with a difficult temperament living in dysfunctional families (Karreman et al., 2009; Van Aken et al., 2007). Furthermore, negative emotionality is most likely to lead to maladaptive outcomes when parents are interfering by using negative control (Morris et al., 2002; Putnam et al., 2002; Rubin et al., 1997, 2002). These results suggest that certain types of temperament predispose to problem behavior, especially in some contexts, as assumed by the vulnerability model.

Positive control may influence the link between impulsivity and externalizing problems through self-regulation and compliance. Because impulsive children have weak inhibitory competencies, they initiate responses faster than children who are not impulsive. Consequently, these children often fail to comply with parental attempts to stop or to redirect their actions (Bates et al., 1998). Therefore, they need more external control to prevent aggressive, disruptive and noncompliant behavior (Bradley & Corwyn, 2008; Campbell, 1995). More specifically, the results of this study suggest that impulsive children need parents who structure their environments, who clearly set limits and who are sensitive. So, impulsive children may benefit from positive parental control, because positive control fosters self-regulation and compliance (Aunola & Nurmi, 2005).

In contrast, negative control, which contained negativity and investment, may constrain development (Park et al., 1997). Fearful children need support, but not force, to expose themselves to novel stimuli (Crockenberg & Leerkes, 2003). The aspect of overinvestment might explain why negative control strengthened the relation between fear and internalizing problems.

Fearful children with overinvolved parents might feel forced to expose themselves to novel stimuli, leading to stress and internalizing problems, or alternatively, these children might be shielded from opportunities to learn how to handle mild stressors independently. Also, parents who use negative control, might communicate an inconsistent message of negativity on the one hand and closeness to the child on the other hand. Such enmeshment restricts children's expression of their own thoughts and emotions. This may lead to internalizing problems (Aunola & Nurmi, 2005). Moreover, fearful children are thought to be especially sensitive to negativity (Colder, Lochman, & Wells, 1997). Thus, negative control may not be an adequate technique to control fearful children, because it may expose children to stress and to inconsistent parenting.

Earlier research, mostly focusing on non-clinical samples consisting of families with the mother as the primary caregiver, generally showed that problem behavior is more strongly related to maternal than paternal parenting (Rothbaum & Weisz, 1994). In clinical referred samples including pre-adolescents and adolescents, stronger effects were found for fathering (Belsky et al., 1998). The results of the present study, focusing on non-clinical double income families, suggest that mothers and fathers play an equally important role. The patterns of association were the same for mothers and fathers; maternal and paternal parenting were both related to externalizing problems, to impulsivity and to sadness. Negative control of both mothers and fathers strengthened the relation between fear and internalizing problems. However, the results suggest that mothers and fathers play different roles in the families with respect to positive control. Paternal positive control, but not maternal positive control, buffers the relation between impulsivity and externalizing problems. This is consistent with earlier findings of Park et al. (1997). Children were found to be more compliant to fathers than to mothers (Calzada, Eyberg, Rich, & Querido, 2004), possibly because fathers often occupy a dominant position in the family (DeKleyn et al., 1998).

The relation between temperament and problem behavior was not mediated by parenting. The mediating model may be more likely in a risk sample in which temperament, negative parenting and behavior problems are all relatively high. Highly difficult children may elicit more negative control from their parents, which in turn could predict externalizing problems. However, mediational effects were found in earlier research on older children. For example, infants' early negative emotionality elicited negative control at the age of 4, which in turn predicted externalizing problems in adolescence (Collins et al., 2000). This suggests that mediational effects may appear over the course of development, and may not be apparent in the preschool period.

The study has some limitations. First, recruitment through day care leads to a specific sample. Participating families were highly educated, primarily white, middle- to high-class, double-income and well-functioning. For generalization to other populations, the findings need to be replicated in other family samples, such as ethically diverse, low-class and clinically distressed families. Second, because of the correlational nature of the study, no conclusions can be drawn about the direction of effects. Third, the interaction effects (see Figs. 1 and 2) should be interpreted with caution. Because multiple regression analyses were conducted, the effects might be found due to a capitalization of chance. However, this does not indicate that the results are not relevant. The steps with significant interaction effects added 6–8% of explained variance to the model. Because the effects of the temperament variables were medium to large, it is important to consider how much of the unexplained variance is explained by the interaction terms. The temperament variables and the parenting variables explained around 51% and 37% of the variance in externalizing and internalizing problems, respectively. For externalizing and internalizing problems interactions explained, respectively, more than 10% of the unexplained variance. These effects are small to medium, according to Cohen (2003). Fourth, studies have found different relations between temperament and problem behavior for boys and girls (Colder, Mott, & Berman, 2002). Future research should investigate the role of child gender, as well as combinations of parent and child gender.

Notwithstanding these limitations, the findings of this study are compelling because of three main reasons. First, observational measures of parenting are not likely to reflect reporter bias or confounding of items (Meyer et al., 2003). Second, Putnam et al. (2002) recently reviewed research on child temperament and parenting. Almost all the reviewed studies only investigated maternal parenting. The generalizability of this study is not restricted to mothers. Third, because multiple reporters were used to assess temperament and problem behavior, these variables could be measured across situations, which positively affect the validity of the study (Meyer et al., 2003).

In conclusion, this study shows that different temperamental factors predict externalizing and internalizing problems. Furthermore, the results suggest that the relation between temperament and problem behavior is complex and affected by both maternal and paternal parental factors. So, child adjustment is not only the result of children's temperamental characteristics. Child adjustment is affected by the specific way in which parents and children interact.

References

Aunola, K., & Nurmi, J. E. (2005). The role of parenting styles in children's problem behavior. *Child Development*, *76*, 1144–1159.

Baron, R. M., & Kenny, D. A. (1986). The moderator–medieator distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.

Bates, J. E, Pettit, G. S., Dodge, K. A., & Ridge, B. (1998). Interaction of temperamental resistance to control and restrictive parenting in the development of externalizing behavior. *Developmental Psychology*, *34*, 982–995.

Belsky, J., Bakermans-Kranenburg, M. J., & van Ijzendoorn, M. H. (2007). For better and for worse: Differential susceptibility to environmental influences. *Current Directions in Psychological Science*, *16*, 300–304.

Belsky, J., Hsieh, K.-H., & Crnic, K. (1998). Mothering, fathering, and infant negativity as antecedents of boys' externalizing problems and inhibition at age 3 years: Differential susceptibility to rearing experience? *Development and Psychopathology*, *10*, 301–319.

Bongers, I. L., Koot, H. M., Van der Ende, J., & Verhulst, F. C. (2003). The normative development of child and adolescent problem behavior. *Journal of Abnormal Psychology*, *112*, 179–192.

Bonney, J. F., Kelley, M. L., & Levant, R. F. (1999). A model of fathers's behavioral involvement in child care in dual-earner families. *Journal of Family Psychology*, *13*, 401–415.
Bradley, R. H., & Corwyn, R. F. (2008). Infant temperament, parenting, and externalizing behavior in first grade: A test of the differential susceptibility hypothesis. *Journal of Child Psychology and Psychiatry*, *49*, 124–131.
Calzada, E. J, Eyberg, S. M., Rich, B., & Querido, J. G. (2004). Parenting disruptive preschoolers: Experiences of mothers and fathers. *Journal of Abnormal Child Psychology*, *32*, 203–213.
Campbell, S. B. (1995). Behavioral problems in preschool children: A review of recent research. *Journal of Child Psychology and Psychiatry*, *36*, 113–149.
Cohen, J. (2003). A power primer. In A. E. Kazdin (Ed.), *Methodological issues and strategies in clinical research* (3rd ed., pp. 427–436). Washington, DC: American Psychological Association.
Colder, C. R., Lochman, J. E., & Wells, K. C. (1997). The moderating effects of childrens' fear and activity level on relations between parenting practices and childhood symptomatology. *Journal of Abnormal Child Psychology*, *25*, 251–263.
Colder, C. R., Mott, J. A., & Berman, A. S. (2002). The interactive effects of infant activity level and fear on growth trajectories of early childhood behavior problems. *Development and Psychopathology*, *14*, 1–23.
Collins, W. A., Maccoby, E. E., Steinberg, L., Hetherington, E. M., & Bornstein, M. H. (2000). Contemporary research on parenting: The case for nature and nurture. *American Psychologist*, *55*, 218–232.
Crockenberg, S., & Leerkes, E. (2003). Infant negative emotionality, caregiving, and family relationships. In A. C. Crouter, & A. Booth (Eds.), *Children's influence on family dynamics: The neglected side of family relationships* (pp. 57–78). New Jersey: Lawrence Erlbaum Associates, Publishers.
DeKleyn, M., Speltz, M. L., & Greenberg, M. T. (1998). Fathering and early onset conduct problems: Positive and negative fathering, father–son attachment and the marital context. *Clinical Child and Family Psychology Review*, *1*, 3–21.
Egger, H. L., & Angold, A. (2006). Common emotional and behavioural disorders in preschool children: Presentation, nosology, and epidemiology. *Journal of Child Psychology and Psychiatry*, *47*, 313–337.
Eisenberg, N., Cumberland, A., Spinrad, T. L., Fabes, R. A., Shepard, S. A., Reiser, M., et al. (2001). The relations of regulation and emotionality to children's externalizing and internalizing problem behavior. *Child Development*, *72*, 1112–1134.
Eisenberg, N., Sadovsky, A., Spinrad, T. L., Fabes, R. A., Losoya, S. H., Valiente, C., et al. (2005). The relations of problem behavior status to children's negative emotionality, and impulsivity: Concurrent relations and prediction of change. *Developmental Psychology*, *41*, 193–211.
Goodman, R. (1997). The strength and Difficulties Questionnaire: A research note. *Journal of Child Psychology and Psychiatry*, *38*, 581–586.
Goodman, R., & Scott, S. (1999). Comparing the Strengths and Difficulties Questionnaire and the Child Behavior Checklist: Is small beautiful? *Journal of Abnormal Child Psychology*, *27*, 17–24.
Jaccard, J., Turrisi, R., & Wan, C. K. (1990). *Interaction effects in multiple regression*. London: Sage.
Karreman, A., Van Tuijl, C., Van Aken, M. A. G., & Deković, M. (2009). Predicting young children's externalizing problems: Interactions among effortful control, parenting, and child gender. *Merrill-Palmer Quarterly*, *55*, 111–134.
Lemery, K. S., Essex, M. J., & Smider, N. A. (2002). Revealing the relation between temperament and behavior problem symptoms by eliminating measurement confounding: Expert ratings and factor analysis. *Child Development*, *73*, 867–882.
Lengua, L. J., West, S. G., & Sandler, F. N. (1998). Temperament as a predictor of symptomalogy in children: Addressing contamination of measures. *Child Development*, *69*, 164–181.
Lerner, R. M., Castellino, D. R., Patterson, T. A., Villaruel, F. A., & McKinney, M. H. (1995). Developmental contextual perspective on parenting. In M. H. Bornstein (Ed.), *Handbook of parenting* (pp. 285–309). New Jersey: Lawrence Erlbaum Associates, Publishers.
Leve, L. D., Kim, H. K., & Pears, K. C. (2005). Childhood temperament and family environment as predictors of internalizing and externalizing trajectories from ages 5 to 17. *Journal of Abnormal Child Psychology*, *33*, 505–520.
Liebetrau, A. M. (1983). *Measures of association*. Beverly Hills, CA: Sage.
Lindahl, K. M. (2001). Methodological issues in family observational research. In P. K. Kerig, & K. M. Lindahl (Eds.), *Family observational coding systems: Resources for systemic research* (pp. 23–32). Mahwah, NJ: Lawrence Erlbaum Associates.
Majdandžić, M., & Van den Boom, D. C. (2001). *Dutch version of the Children's Behavior Questionnaire*. Unpublished manuscript, University of Amsterdam, The Netherlands.
Mantymaa, M., Puura, K., Luoma, I., Salmelin, R. K., & Tamminen, T. (2004). Early mother–infant interaction, parental mental health and symptoms of behavioral and emotional problems in toddlers. *Infant Behavior & Development*, *27*, 134–149.
McHale, J. P. (1995). Coparenting and triadic interactions during infancy: The roles of marital distress and child gender. *Developmental Psychology*, *31*, 985–996.
Mesman, J., Bongers, I. L., & Koot, H. M. (2001). Preschool developmental pathways to preadolescent internalizing and externalizing problems. *Journal of Child Psychology and Psychiatry*, *42*, 679–689.
Meyer, G. J., Finn, S. E., Eyde, L. D., Kay, G. G., Moreland, K. L., Dies, R. R., et al. (2003). Psychological testing and psychological assessment. In A. E. Kazdin (Ed.), *Methodological issues and strategies in clinical research* (3rd ed., pp. 265–315). Washington, DC: American Psychological Association.
Morris, A. S., Silk, J. S., Steinberg, L., Sessa, F. M., Avenevoli, S., & Essex, M. J. (2002). Temperamental vulnerability and negative parenting as interacting predictors of child adjustment. *Journal of Marriage and Family*, *64*, 461–471.
Muris, P., Meesters, C., & Van den Berg, F. (2003). The Strengths and Difficulties Questionnaire (SDQ): Further evidence for its reliability and validity in a community sample of Dutch children and adolescents. *European Child and Adolescent Psychiatry*, *12*, 1–8.
Nigg, J. T. (2006). Temperament and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, *47*, 395–422.
Newby, R. F., & Fischer, M. (1991). Parent training for families of children with ADHD. *School Psychological Review*, *20*(2), 252–266.
Olson, S. L., Sameroff, A. J., Kerr, D. C., Lopez, N. L., & Wellman, H. M. (2005). Developmental foundations of externalizing problems in young children: The role of effortful control. *Development and Psychopathology*, *17*, 24–45.
Park, S. Y., Belsky, J., Putman, S., & Crnic, K. (1997). Infant emotionality, parenting, and 3-year inhibition: Exploring stability and lawful discontinuity in a male sample. *Developmental Psychology*, *33*, 218–227.
Putnam, S., Sanson, A. V., & Rothbart, M. K. (2002). Child temperament and parenting. In M. H. Bornstein (Ed.), *Handbook of parenting* (2nd ed., Vol. 1, pp. 255–277). New Jersey: Lawrence Erlbaum Associates.
Robins, R. W., John, O. W., Caspi, A., Moffit, T. E., & Strouthamer-Loeber, M. (1996). Resilient, overcontrolled, and undercontrolled boys: Three replicable personality types. *Journal of Personality and Social Psychology*, *70*, 157–171.
Rothbart, M. K., Ahadi, S. A., Hershy, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development*, *72*, 1394–1408.
Rothbart, M. K., Ellis, L. K., & Posner, M. I. (2004). Temperament and self-regulation. In R. F. Baumeister, & K. D. Vohs (Eds.), *Handbook of self-regulation: Research theory and applications* (pp. 283–300). New York: Guilford Press.
Rothbaum, F., & Weisz, J. R. (1994). Parental care giving and child externalizing behavior in nonclinical samples: A meta-analysis. *Psychological Bulletin*, *116*, 55–74.
Rubin, K. H., Burgess, K. B., Dwyer, K. M., & Hastings, P. D. (2003). Predicting preschoolers' externalizing behaviors from toddler temperament, conflict, and maternal negativity. *Developmental Psychology*, *39*, 164–176.
Rubin, K. H., Burgess, K. B., & Hastings, P. D. (2002). Stability and social–behavioral consequences of toddlers' inhibited temperament and parenting behaviors. *Child Development*, *73*, 483–495.
Rubin, K. H., Hastings, P. D., Stewart, S. L., Henderson, H. A., & Chen, X. (1997). The consistency and concomitants of inhibition: Some of the children, all of the time. *Child Development*, *68*, 467–483.
SDQ. (n.d.). Retrieved 1 September 2002 from http://www.sdqinfo.com/questionnaires/dutch/n1.pdf.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Boston: Allyn and Bacon.
Van Aken, C., Junger, M., Verhoeven, M., Van Aken, M. A. G., & Deković, M. (2007). The interactive effects of temperament and maternal parenting on toddlers' externalizing behaviours. *Infant and Child Development*, *16*, 553–572.
Van Widenfelt, B. M., Goedhart, A. W., Treffers, P. D. A., & Goodman, R. (2003). Dutch version of the Strengths and Difficulties Questionnaire. *European Child and Adolescent Psychiatry*, *12*, 281–289.
Wenar, C., & Kerig, P. (2000). *Developmental psychology: From infancy through adolescence*. Boston: McGrawHill.
Whisman, M. A., & McClelland, H. (2005). Designing, testing, and interpreting interactions and moderator effects in family research. *Journal of Family Psychology*, *19*, 111–120.